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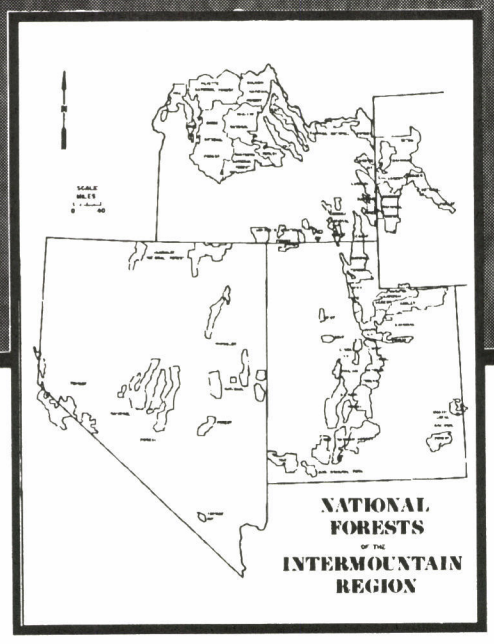
Region
Ogden, Utah

Forest Insect and Disease Conditions in the Intermountain Region 1993



FOREST INSECT AND DISEASE CONDITIONS

in the

Intermountain Region

1993

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April
1994

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TABLE OF CONTENTS

Subject	Page
Introduction	1
Résumé of Conditions	2
Status of Insect Conditions	3
Status of Disease Conditions	8
Tables	15
Figures	23
Special Project Update	29
Recent Publications	31

TABLE OF CONTENTS (CONTINUED)

Page

TABLES

Table 1. Number of trees killed and acres infested by bark beetles on National Forests of Region 4 during 1993 as determined by aerial detection surveys. 15
2. Status of mountain pine beetle infestations by state during 1993. 16
3. Status of spruce beetle infestations by state during 1993. 17
4. Status of Douglas-fir beetle infestations by state during 1993. 18
5. Status of western pine beetle/*Ips* beetle infestations by state during 1993. 19
6. Status of Jeffrey pine beetle infestations by state during 1993. 19
7. Status of western balsam bark beetle infestations by state during 1993. 20
8. Status of fir engraver beetle infestations by state during 1993. 21
9. Acres of defoliation by western spruce budworm in Region 4 during 1993 as determined by aerial detection surveys. 22

FIGURES

Figure 1. Trees killed by bark beetles in Region 4 between 1981 & 1993. 23
2. Acres defoliated by Douglas-fir tussock moth & western spruce budworm in Region 4 between 1960 & 1993. 23
3. Areas infested by mountain pine beetle and Jeffrey pine beetle in Region 4 during 1993 as observed during aerial detection surveys. 24
4. Areas infested by spruce beetle in Region 4 during 1993 as observed during aerial detection surveys. 25
5. Areas infested by Douglas-fir beetle in Region 4 during 1993 as observed during that aerial detection surveys. 26
6. Areas infested by western pine beetle/*Ips* beetle in Region 4 during 1993 as observed during aerial detection surveys. 27
7. Areas infested by fir engraver beetle and western balsam bark beetle in Region 4 during 1993 as observed during aerial detection surveys. 28

INTRODUCTION

This report summarizes the status of insect and disease pests of forest trees in the Intermountain Region. Status of insects is based largely on annual and special aerial detection surveys which are conducted over 14,000,000 acres of forested lands. Status of diseases is based largely on ground observations and surveys.

General insect and disease information is summarized in the Résumé of Conditions.

Numbers of trees killed by major bark beetles and acreage of defoliating insect activity are displayed in Tables 1 through 9. Figure 1 displays the number of trees killed by bark beetles in Region 4 between 1981 and 1993. Figure 2 displays the number of acres defoliated by Douglas-fir tussock moth and western spruce budworm in Region 4 between 1960 and 1993. Estimates are based on aerial survey information. General location of major insect activity is shown in Figures 3 through 7.

The Special Project Update summarizes on-going studies being conducted by Forest Pest Management.

Recent publications are listed to aid the reader in locating specific, recent pest information of interest.

RÉSUMÉ OF CONDITIONS

During 1993, mountain beetle activity in lodgepole and ponderosa pine increased in southern Idaho and Utah and decreased in western Wyoming. Approximately 53,700 dying trees were detected in 1993, compared to 16,800 trees in 1992. Most of the activity occurred on the Sawtooth National Recreation Area located within the Sawtooth National Forest in Idaho and on the Dixie National Forest in Utah. Increases in mountain pine beetle activity in whitebark pine occurred on the Payette in Idaho and the Bridger-Teton National Forest in western Wyoming.

Tree mortality attributed to the spruce beetle remained static with 59,200 trees killed in 1993, compared to 56,100 trees killed in 1992. Most of this in activity occurred on the Payette National Forest in southern Idaho and on the Manti-LaSal and Dixie National Forests in Utah.

Douglas-fir beetle activity decreased during 1993 with 103,200 trees killed, compared to 118,900 in 1992. In southern Idaho, the largest infestations occurred on the Boise, Payette, Caribou, and Sawtooth National Forests in southern Idaho.

Western pine beetle activity increased with 18,500 trees being killed in 1993, compared to 8,900 trees killed in 1992. Activity was concentrated on the Boise and Payette National Forests in southern Idaho. Ips beetle attacks within areas of western pine beetle activity continued to increase.

Tree mortality attributed to western balsam bark beetle increased during 1993. Approximately 391,000 trees were killed in 1993, compared to 187,400 trees killed in 1992. Mortality was extensive throughout the Region is areas containing the host types.

Fir engraver beetle continued to cause extensive mortality of true firs throughout the Region with 394,700 trees killed in 1993, compared to 269,800 trees killed in 1992. Most of the activity was located on the Toiyabe National Forest in western Nevada, where 262,400 red and white fir trees were killed.

Defoliating insect activity dramatically decreased in 1993. No tree defoliation by Douglas-fir tussock moth was detected. Tree defoliation attributed to western spruce budworm was down from 32,000 acres in 1992, to only 225 acres in 1993. This activity was reported on the Challis National Forest in Idaho.

For the first time since the inception of the The Utah Gypsy Moth Eradication Project near Salt Lake City, Utah, no gypsy moths were detected in the treatment area. Multiagency gyspy moth detection trapping occurred in all states in the Region. Five gypsy moths were detected in Utah and one in Wyoming.

Because of the difficulty in aerially detecting visible symptoms, detection and monitoring of most forest pathogens is accomplished via ground surveys. Activity of many disease agents is reported only in general terms because of the sporadic and short duration of most foliar pathogens and the relatively static nature of root, stem, and branch pathogens and the difficulty in assessing change. Since this report reflects the change in pest status from year to year, disease information is frequently omitted unless a significant change has occurred. It should not be construed that forest diseases are absent or unimportant within the Region. In fact, they likely cause more direct mortality and growth loss than do insect pests.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Cooley spruce gall adelgid *Adelges cooleyi*	Spruce	Idaho Utah Wyoming	This adelgid was found in forested stands and ornamental trees throughout the Region; impact appeared greatest in ornamental trees.
Dioryctria borers *Dioryctria spp.*	Ornamental pines	Idaho	Ornamental pines in Boise, Idaho sustained frequent attacks by *Dioryctria* borers.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho Utah Wyoming	Mortality decreased in southern Idaho and Wyoming and increased in Utah. In southern Idaho, 89,900 trees were killed in 1993 compared to 105,500 trees killed in 1992. The largest infestations were located on the Boise, Caribou, Payette, and Sawtooth National Forests. Smaller infestations were located on the Challis, Salmon, and Targhee National Forests. A static to decreasing mortality trend was observed throughout Forests in southern Idaho. In Utah, 6,700 trees were killed in 1993, an increase from 5,100 trees killed in 1992. Infestations were located on the Manti-LaSal, Uinta, Wasatch-Cache, and Ashley National Forests. In Wyoming, activity decreased on the Bridger-Teton National Forest where 6,600 trees were killed in 1993, compared to 8,300 trees killed in 1992.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir, True firs	Idaho Utah	In 1992, Douglas-fir tussock moth populations collapsed. No defoliation was observed in 1993.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
European gypsy moth *Lymantria dispar*	Various deciduous species	Utah	In the fifth year of the Utah Gypsy Moth Eradication Project, approximately 5,150 acres were treated. No moths were detected within the treatment areas. Five gypsy moths were detected in Utah, outside the eradication project area, and one moth was detected in Wyoming.
Fir engraver beetle *Scolytus ventralis*	Grand fir, White fir, Red fir, Subalpine fir	Idaho Nevada Utah Wyoming	Regionwide, true fir morality from fir engraver beetle attack increased from 269,800 trees in 1992, to 394,700 trees in 1993. Increasing mortality was observed in Idaho, Nevada, and Wyoming; decreasing mortality was observed in Utah. In Idaho, mortality increased from 41,900 trees in 1992, to 67,200 trees in 1993. Activity was concentrated on the Boise and Payette National Forests. In Utah, 32,800 trees were killed in 1992, while in 1993, 45,100 trees were killed. Tree mortality decreased on the Wasatch-Cache National Forest and increased on the Dixie and Uinta National Forests. On the Bridger-Teton National Forest, 1,400 trees were killed; the first time significant fir engraver beetle activity has been observed in Wyoming. The largest infestation in the Region was located on the Toiyabe National Forest and adjacent state and private land in Nevada where mortality increased from 195,100 trees killed in 1992, to 281,000 in 1993.
Jeffrey pine beetle *Dendroctonus jefferyi*	Jeffery pine	Nevada	About 20,700 Jeffrey pines were killed by this beetle on the Toiyabe National Forest and adjacent lands in Nevada.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine,	Idaho Utah Wyoming	Increases in tree mortality occurred in southern Idaho and Utah, while decreases in mortality occurred in western Wyoming. In southern Idaho, 41,300 trees were killed in 1993, compared to 10,500 trees killed in 1992. The largest single area of tree mortality was located within the Sawtooth National Recreation Area on the Sawtooth National Forest. Smaller outbreaks were located on all other National Forest in southern Idaho. In Utah, 11,500 trees were killed. The largest area of mortality was located on the Dixie National Forest in southern Utah where 7,700 trees were killed. Elsewhere, smaller outbreaks were located on all other National Forests in Utah. A decrease in mountain pine beetle activity occurred in western Wyoming on the Bridger-Teton National Forest where 900 trees were killed in 1993, compared to 2,700 in 1992.
Mountain pine beetle *Dendroctonus ponderosae*	Whitebark pine	Idaho Nevada Utah Wyoming	Increases in mountain pine beetle activity in whitebark pine occurred in Idaho and western Wyoming. On the Payette National Forest in southern Idaho, 2,000 dying trees were detected, while on the Bridger-Teton National Forest in western Wyoming, 500 dying trees were detected. Smaller, less extensive infestations occurred in Utah and Nevada.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Oyster shell scale *Lepidosaphes ulmi*	Cottonwood, Aspen, Willow	Utah	Light to moderate populations of this insect, infesting cottonwoods and aspen, were located in Ranch Canyon on the Bureau of Land Management, Beaver Resource Area near Milford, Utah. Heavy populations were infesting approximately 20 acres of coyote willow in the Vernon Creek and Little Valley campgrounds on the Spanish Fork Ranger District of the Uinta National Forest.
Pine engraver beetle *Ips pini*	Lodgepole pine, Ponderosa pine	Idaho Nevada Utah	Activity of this insect, often associated with other bark beetles, increased on the Boise and Payette National Forests in southern Idaho. In Utah, populations were noted in the slash of ponderosa and lodgepole pine.
Spruce beetle *Dendroctonus rufipennis*	Spruce	Idaho Utah Wyoming	Mortality from spruce beetle infestation remained static during 1993 with 58,200 dying trees observed Regionwide. In Idaho, 36,700 trees were killed on the Payette National Forest, the largest infestation in the Region. In Utah, 22,500 trees were killed on the Manti-LaSal and Dixie National Forests, while a smaller outbreak, located on the Fishlake National Forest, killed 700 trees. No significant spruce beetle activity was observed on the Bridger-Teton National Forest in Wyoming.
Sugar pine tortix *Choristoneura lambertiana*	Pines	Idaho	Light to moderate defoliation of lodgepole pines occurred in scattered 5-10 acre pockets on the Salmon National Forest in Idaho.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Western balsam bark beetle *Dryocoetes confusus*	Subalpine fir	Idaho Utah Wyoming	Increases in mortality occurred Regionwide with 391,100 dying subalpine fir observed. In southern Idaho, 141,100 trees were killed and extensive areas of the Caribou, Sawtooth, and Targhee National Forests are infested. Smaller infestations occurred on the Boise, Challis, and Salmon National Forests. In Utah, 125,700 trees were killed. Mortality was located on the Manti LaSal, Uinta, and Wasatch Cache National Forests. On the Bridger-Teton National Forest in western Wyoming, 124,300 trees were killed.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Western pine beetle activity, often associated with pine engraver beetle activity, increased on the Boise and Payette National Forests with 18,500 trees killed in 1993.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, True firs	Idaho	About 225 acres of light defoliation was observed on the Challis National Forest.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Aspen trunk rot *Phellinus tremulae*	Aspen	Idaho Nevada Utah Wyoming	Decay occurs in most aspen stands in the Region and is increasingly common as aspen stands exceed 80 years of age.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Idaho Utah Wyoming	Infection occurs infrequently throughout Idaho and Utah. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in southern Idaho. In Wyoming and northern Utah, infection frequently occurs on lodgepole pine in localized pockets.
Pinyon blister rust *Cronartium occidentale*	Pinyon pine	Idaho Utah	This disease was observed on the Moab Ranger District, Manti-LaSal National Forest, Utah, and in the Raft River Mountains on the Sawtooth National Forest, Idaho.
Cytospora canker of true firs *Cytospora abietis*	True firs	Idaho Utah Wyoming	Branch flagging, top-killing, and mortality attributed to this fungus occurred in localized areas throughout host type. This disease was frequently found occurring with western balsam bark beetle attacks.
Canker of subalpine fir (*Pleurocytospora*-like)	Subalpine fir	Idaho	Branch flagging, top-killing, and mortality attributed to this fungus occurred in localized areas throughout host type. Infection levels declined in southern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Dwarf mistletoes *Arceuthobium spp.*	Douglas-fir, Lodgepole pine, Ponderosa pine, Western larch, Jeffrey pine, True firs	Idaho Nevada Utah Wyoming	Suppression projects continue to remove infected overstory trees; however this forest disease remains the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is as follows: lodgepole pine = 45% infected, ponderosa pine = 25% infected, and Douglas-fir = 33% infected.
True mistletoe on Juniper *Phoradendron juniperinum*	Junipers	Nevada Utah	This pest occurs on juniper on the Fishlake and Dixie National Forests in Utah and in Great Basin National Park in Nevada.
Limb rust *Peridermium filamentosum*	Ponderosa pine	Utah	Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.
Red ring rot *Phellinus pini*	Western larch, True firs, Spruce, Douglas-fir, Pines	Idaho Utah Wyoming	Infection intensity varies throughout stands in the Region.
Rust-red stringy rot *Echinodontium tinctorium*	Grand fir, White fir, Subalpine fir	Idaho Nevada Utah	Decay caused by this fungus is common in mature and overmature stands of true firs.
Stalactiform blister rust *Cronartiumn coleosporiodes*	Lodgepole pine	Idaho Nevada Utah	This rust occurs in localized areas throughout the host type. Heavy infection has been noted in localized areas on the Boise, Payette, Sawtooth, Challis, and Targhee National Forests in Idaho.
Other stem decays: *Cryptoporus volvatus* *Fomitopsis officinalis* *Polyporous sulphureus*	Various conifers	Idaho Nevada Utah Wyoming	A large number of minor stem decay agents, too numerous to list, occur with varying intensity throughout the Region.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Idaho Utah Wyoming	Gall rust occurs extensively throughout the host types. Varied infection levels are observed with localized heavy infection levels present in both host species.
White Pine blister rust *Cronartium ribicola*	Whitebark pine	Idaho	White pine blister rust occurs infrequently in southern Idaho. High levels of infection in localized areas result in branch, top, and entire tree mortality of hosts.
Root Diseases			
Annous root disease *Heterobasidion annosum*	Douglas-fir, Engelmann spruce, Lodgepole pine, Ponderosa pine, Jeffrey pine, True firs	Idaho Nevada Utah Wyoming California	Infection causes varying amounts of root and butt rot in mature individuals of many tree species, and may result in predisposition to windthrow and/or beetle attack. In grand fir and subalpine fir, it is commonly found as a butt rot. Infection-induced mortality occurs occasionally in young ponderosa pine and seldom in other hosts.
Armillaria root disease *Armillaria* sp.	Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir	Idaho Nevada Utah Wyoming	Evidence of Armillaria root disease can be found throughout the Region. In southern Idaho, northern Utah, Nevada, and Wyoming, it functioned primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen killing mature and immature ponderosa pine and mature fir and spruce.
White mottled rot *Ganoderma applanatum*	Aspen	Idaho Nevada Utah Wyoming	This pathogen is commonly observed in association with windthrown aspen on the Dixie, Wasatch-Cache, and Fishlake National Forests in Utah; Humboldt National Forest in Nevada; and Caribou and Sawtooth National Forest in Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Black stain root disease *Ophiostoma wageneri, (=Ceratocystis wageneri)*	Pinyon pine	Idaho Nevada Utah	This fungus causes mortality of pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forests in Utah.
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, Ponderosa pine	Idaho	Decay is common in mature and overmature forests throughout the host type, especially those having a fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity. Trees are seldom killed directly as a result of infection.
Tomentosus root disease *Inonotus tomentosus*	Douglas-fir, Spruce, Subalpine fir	Idaho Utah	This fungus is found alone or associated with *Phaeolus schweinitzii* and *Armillaria spp.* It causes root and butt rot of pole-sized and larger trees predisposing trees to bark beetle attack and windthrow in southern Idaho. In southern Utah, it kills spruce in progressively enlarging disease centers.
Foliage Diseases			
Conifer - Aspen rust **Conifer - Cottonwood rust** *Melampsora medusae* *Melampsora occidentalis*	Aspen, Conifers, Cottonwood	Idaho	Infected cottonwood and aspen were commonly observed in southern Idaho. Some aspen clones were severely defoliated by these fungi. Limited infection of the alternate host conifers was confirmed.
Douglas-fir needle cast *Rhabdocline* spp.	Douglas-fir	Idaho	Incidence decreased with light infection noted throughout the range of Douglas-fir in southern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho	Systemic and annual infections occur throughout the host type. Infection was especially severe in southwestern Idaho. Foliage discoloration caused by this fungus increased in 1993.
Incense cedar broom rust *Gymnosporangium libocedri*	Incense cedar	California Nevada	This disease occurs in isolated patches of host trees on the Toiyabe National Forest in Nevada and California.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Idaho Nevada Utah Wyoming	Infections occur throughout the host's range. Infection intensity varies significantly, but is pandemic in stands south of the Snake River in Idaho.
Fir needle cast *Lirula* spp.	Subalpine fir, Grand fir	Idaho	Infection occurred at endemic levels throughout the host type.
Fir needle rust *Pucciniastrum epilobii*	Subalpine fir	Idaho Wyoming	Seedling and sapling size trees throughout the host type were infected at various levels. A ground survey on the Bridger-Teton National Forest found 9% of the subalpine fir regeneration to be infected.
Larch needle blight *Hypodermella laricis*	Western larch	Idaho	Incidence and severity of infection in west central Idaho were very light. Detection was confounded by severe frost damage that occurred shortly after spring needle flush.
Larch needle cast *Meria laricis*	Western larch	Idaho	Incidence and severity of infection in west central Idaho were very light. Detection was confounded by severe frost damage that occurred shortly after spring needle flush.
Lodgepole pine needle cast *Lophodermella concolor*	Lodgepole pine	Idaho	The worst infection intensity of this needle cast disease since 1978 hit lodgepole pine stands throughout all of southern Idaho in the spring of 1993.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Marssonia blight *Marssonina populi*	Aspen	Idaho Utah Wyoming	In Utah, heavily infected patches, some encompassing over 100 acres, were observed on three National Forests.
Shepherd's crook *Venturia macularis*	Aspen	Idaho Utah	Scattered incidence of light to moderate intensity was noted in southern Idaho and throughout Utah.
Spruce broom rust *Chrysomyxa arctostaphylii*	Engelmann spruce	Idaho Utah Wyoming	Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.
Pine needle rust *Colesporium* spp.	Ponderosa pine, Lodgepole pine	Idaho	Scattered incidence of light to moderate intensity occurred scattered throughout the host types in southern Idaho.
Nursery Diseases			
Fusarium root disease *Fusarium oxysporum*	True firs, Douglas-fir, Ponderosa pine	Idaho Utah	This disease caused small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho and the Lone Peak Nursery in Utah.
Fusarium cortical stem rot *Fusarium avenaceum*	True firs, Douglas-fir, Ponderosa pine	Idaho Utah	This disease caused scattered mortality of primarily 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho, and the Lone Peak Nursery in Utah.
Phytophthora/ Pythium root rot *Phytophthora* spp., *Pythium* spp.	Douglas-fir, Spruce	Idaho Utah	These fungi occur on seedlings and in soil at the Lucky Peak Nursery, Boise National Forest, Idaho, and the Lone Peak Nursery in Utah. Infection results in frequent mortality and culling of 2-0 seedlings.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Abiotic			
Drought effects	All vegetation	Regionwide	Premature needle drop, leaf scorch, and seedling mortality were observed due to six consecutive years of below normal precipitation. Damage was especially apparent on the Toiyabe National Forest in Nevada, which is suffering its eighth year of drought conditions.
Spring Frost	Western larch	Idaho	An early spring frost killed foliage on the Payette National Forest in Idaho.
High Elevation Tornado	Lodgepole pine, Spruce	Utah	Approximately 1,000 acres of Englemann spruce and lodgepole pine were blown down on the Vernal and Roosevelt Ranger Districts of the Ashley National Forest. The late summer tornado is not expected to cause outbreaks of either spruce beetle or mountain pine beetle. Englemann spruce beetle may be of some concern. Some salvage activities may occur on the west fork at White Rocks area on the Vernal Ranger District of the Ashley National Forest.

TABLE 1.--*Number of trees killed and acres infested by bark beetles on National Forest of Region 4 during 1993 as determined by aerial detection surveys.*

	Mountain Pine Beetle		Douglas-fir Beetle		Western Pine Beetle/*Ips*		Spruce Beetle		Fir Engraver Beetle		Western Balsam Bark Beetle		Jeffrey Pine Beetle		Totals	
Forest*	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley	600	400	400	100	--	--	--	--	--	--	2,900	1,500	--	--	3,900	2,000
Boise	1,800	1,200	37,900	43,300	13,500	9,200	500	500	65,700	31,100	9,600	12,300	--	--	129,000	97,600
Bridger-Teton	900	400	6,600	3,000	--	--			1,400	800	124,300	42,000	--	--	133,200	46,200
Caribou	900	500	4,500	3,400	--	--	--	--	--	--	29,900	15,700	--	--	35,300	19,600
Challis	4,300	2,300	900	500	--	--					8,300	3,900	--	--	13,500	6,700
Dixie	7,700	7,000	--	--	--	--	6,200	2,700	5,900	3,300	37,400	11,000	--	--	57,200	24,000
Fishlake	800	600	--	--	--	--	700	500	500	600	11,900	7,600	--	--	13,900	9,300
Manti-LaSal	800	600	2,200	1,800	--	--	15,600	7,600	--	--	15,400	13,200	--	--	34,000	23,200
Payette	4,300	3,400	16,700	17,800	3,000	1,700	35,200	35,600	1,500	1,800	1,800	1,900	--	--	62,500	62,200
Salmon	2,800	1,500	1,400	800	--	--			--	--	1,900	700	--	--	6,100	3,000
Sawtooth	18,200	10,000	22,000	10,000	2,000	1,900	--	--	--	--	45,000	22,700	--	--	87,200	44,600
Targhee	500	300	2,500	1,300	--	--	--	--	--	--	21,600	12,500	--	--	24,600	14,100
Toiyabe	300	200	--	--	--	--	--	--	262,400	98,300	--	--	16,300	12,900	279,000	111,400
Uinta	400	500	300	200	--	--	--	--	22,300	20,400	14,800	13,100	--	--	37,800	34,000
Wasatch-Cache	300	100	3,500	2,500	--	--			16,400	9,800	31,300	18,400	--	--	51,500	30,800
TOTAL	44,600	29,000	98,900	84,700	18,500	12,800	58,200	46,900	376,100	166,100	356,100	176,500	16,300	12,900	968,700	528,700

*Does not include all BLM, Tribes of the Indian Nations, state and private lands adjacent to Forest.

TABLE 2.---*Status of mountain pine beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	19.2	32.8
Other Federal	0.1	0.4
State and Private	16.8	8.1
TOTAL	36.1	41.3

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	9.2	10.6
Other Federal	0.4	0.5
State and Private	0.4	0.4
TOTAL	10.0	11.5

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.4	0.9
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.4	0.9

TABLE 3.---*Status of spruce beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	36.1	35.7
Other Federal	0.0	0.0
State and Private	1.0	1.0
TOTAL	37.1	36.7

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	10.8	22.5
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	10.8	22.5

TABLE 4.---*Status of Douglas-fir beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	77.1	85.9
Other Federal	0.4	0.4
State and Private	2.7	3.6
TOTAL	80.2	89.9

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	4.6	6.4
Other Federal	0.1	0.3
State and Private	0.0	0.0
TOTAL	4.7	6.7

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	3.0	6.6
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	3.0	6.6

TABLE 5.---*Status of western pine beetle/Ips beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	12.8	18.5
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	12.8	18.5

TABLE 6.---*Status of Jeffrey pine beetle infestations by state during 1993.*

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	12.9	16.3
Other Federal	0.0	0.0
State and Private	4.1	4.4
TOTAL	17.0	20.7

TABLE 7.---*Status of western balsam bark beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	69.7	118.1
Other Federal	0.5	0.4
State and Private	21.6	22.6
TOTAL	91.8	141.1

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	64.8	113.7
Other Federal	10.0	6.0
State and Private	10.6	6.0
TOTAL	85.4	125.7

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	42.0	124.3
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	42.0	124.3

TABLE 8.---*Status of fir engraver beetle infestations by state during 1993.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	32.9	67.2
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	32.9	67.2

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	98.3	262.4
Other Federal	0.0	0.0
State and Private	7.6	18.6
TOTAL	105.9	281.0

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	34.1	45.1
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	34.1	45.1

Wyoming

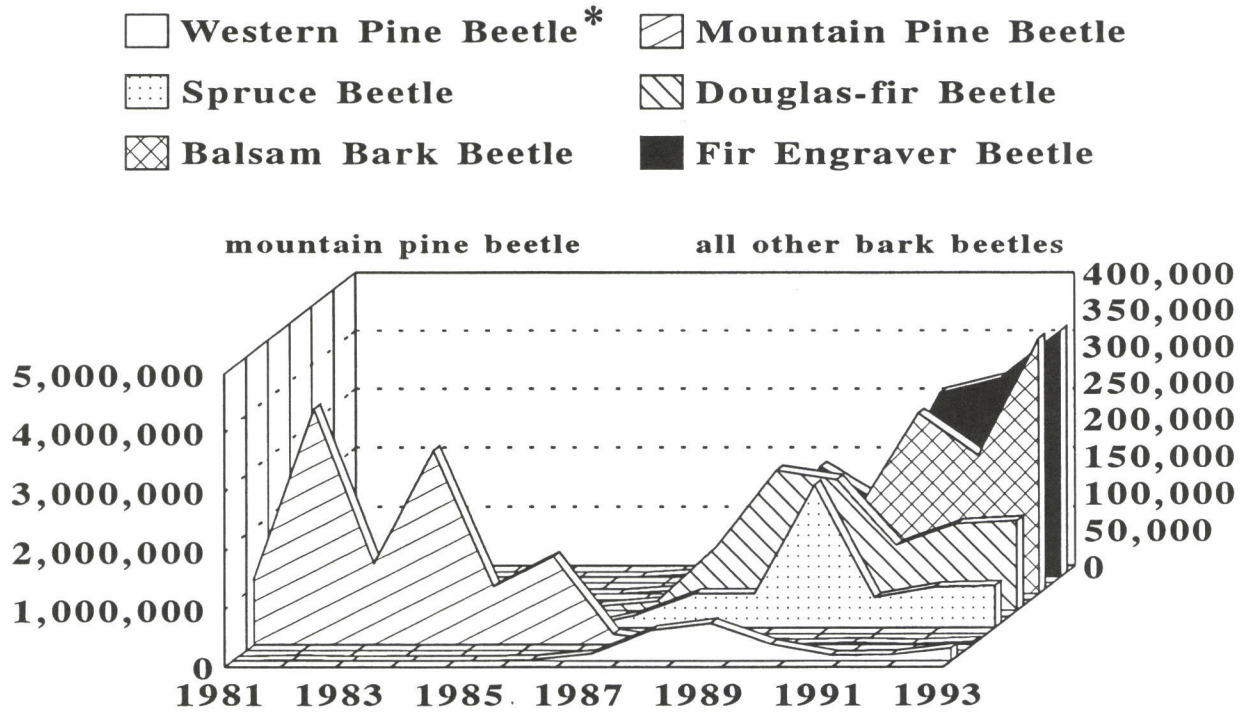
Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.8	1.4
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.8	1.4

TABLE 9.---*Acres of defoliation by western spruce budworm in Region 4 during 1993 as determined by aerial detection surveys.*

Forest and* Adjacent Land	Defoliation Intensity			
	Light	Moderate	Heavy	TOTAL
Challis	225	000	000	225
Salmon	000	000	000	000
R-4 TOTALS	225	000	000	225

*Only portions of Forests flown; actual acreage may be greater.

Figure 1. **Trees killed by bark beetles in Region 4 between 1981 & 1993.**



* Includes *Ips*

Figure 2. **Acres defoliated by Douglas-fir tussock moth & western spruce budworm in Region 4 between 1960 & 1993.**

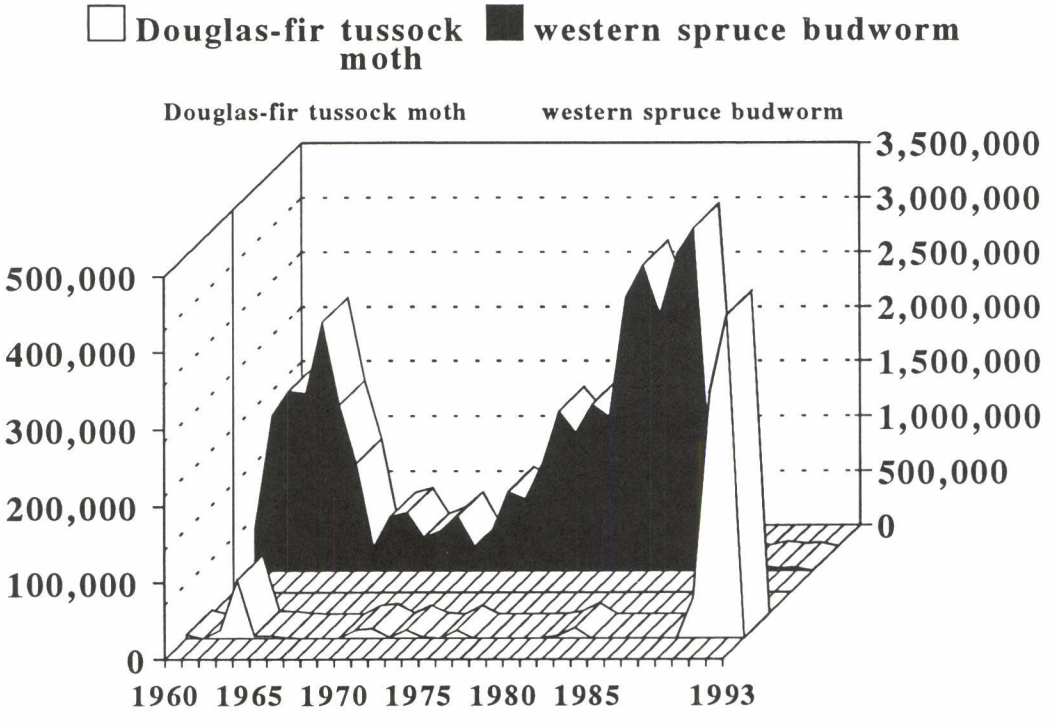


Figure 3. Areas infested by mountain pine beetle and Jeffrey pine beetle in Region 4 during 1993 as observed during aerial detection surveys.

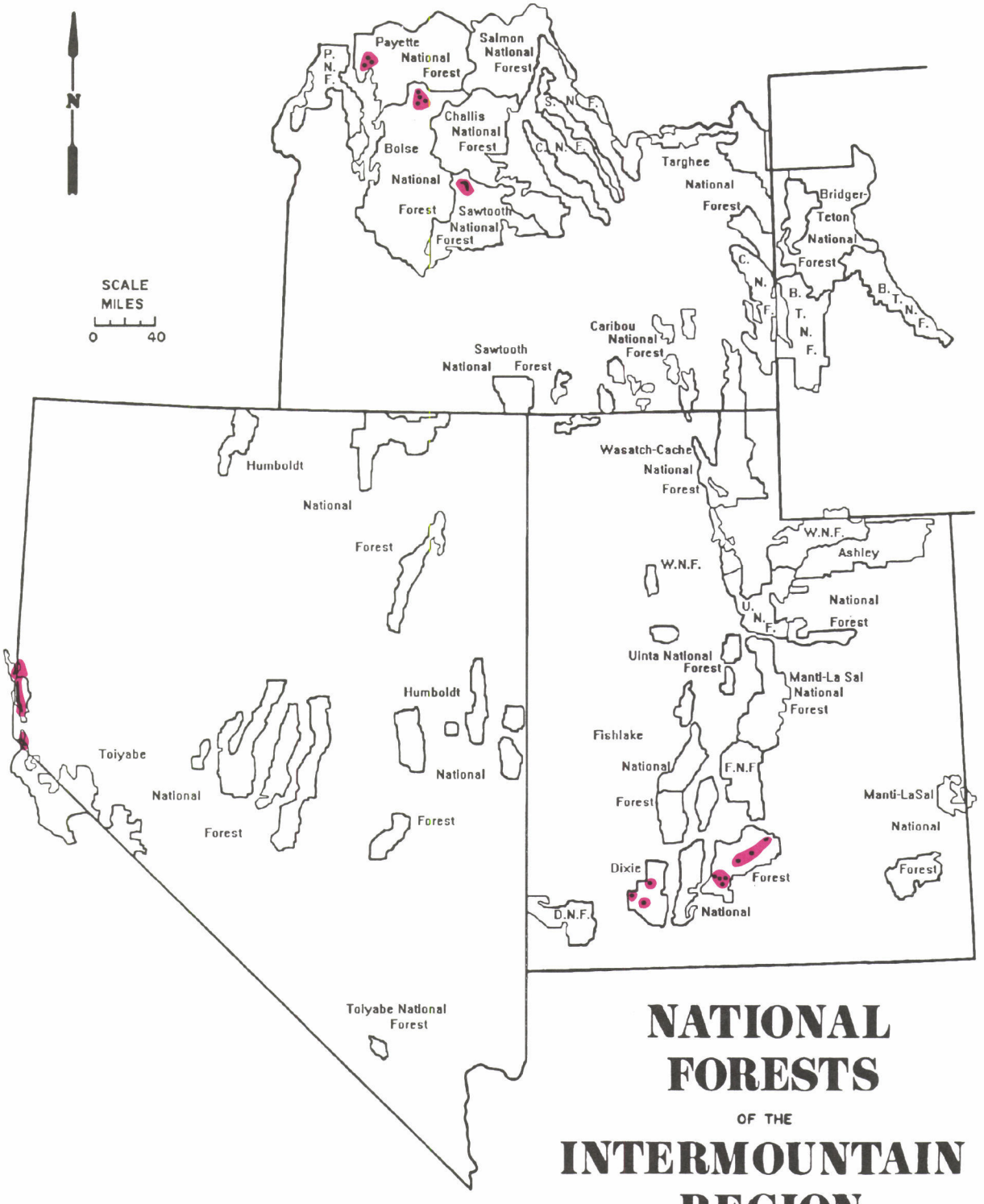


Figure 4. Areas infested by spruce beetle beetle in Region 4 during 1993 as observed during aerial detection surveys.

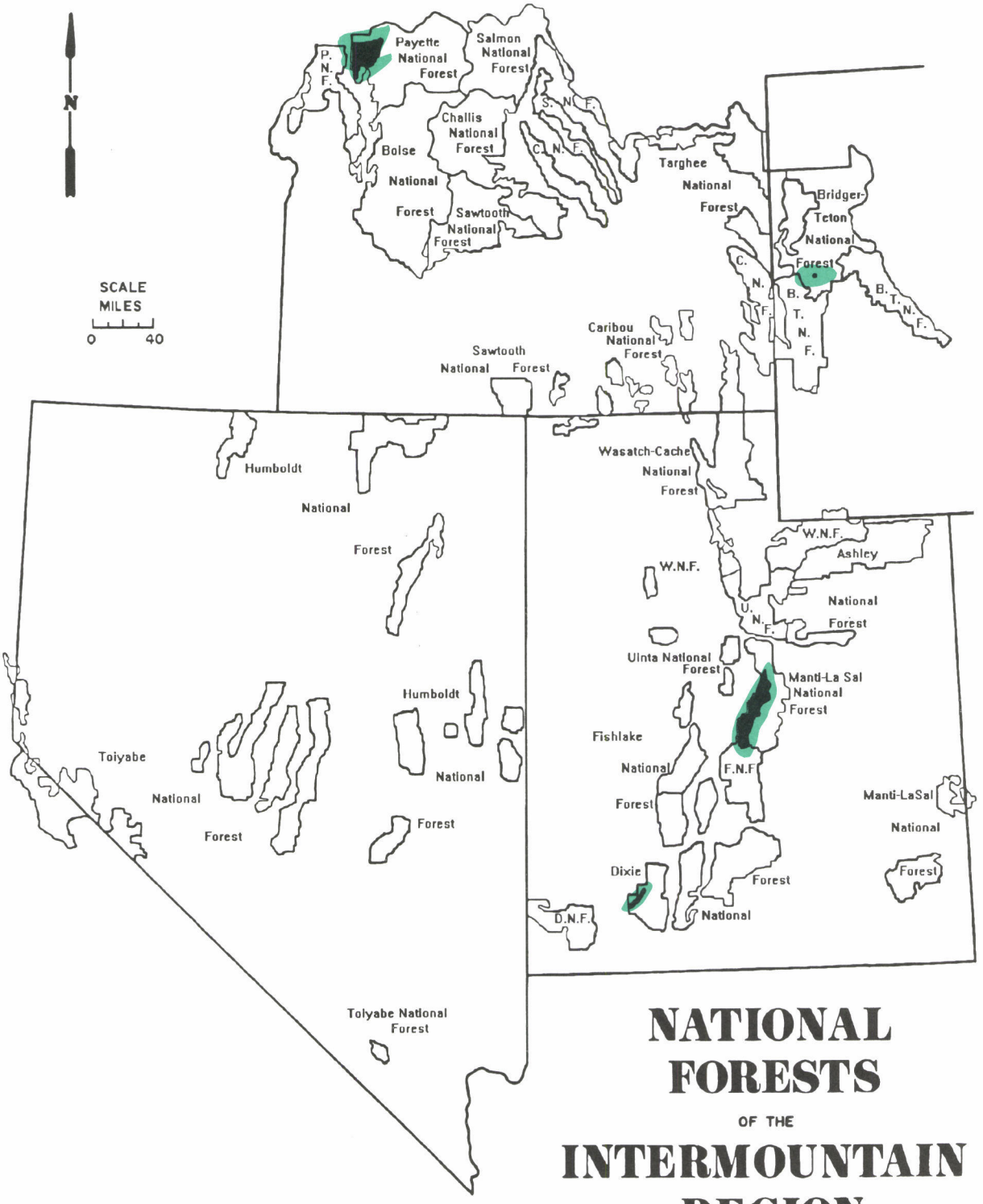


Figure 5. Areas infested by Douglas-fir beetle in Region 4 during 1993 as observed during aerial detection surveys.

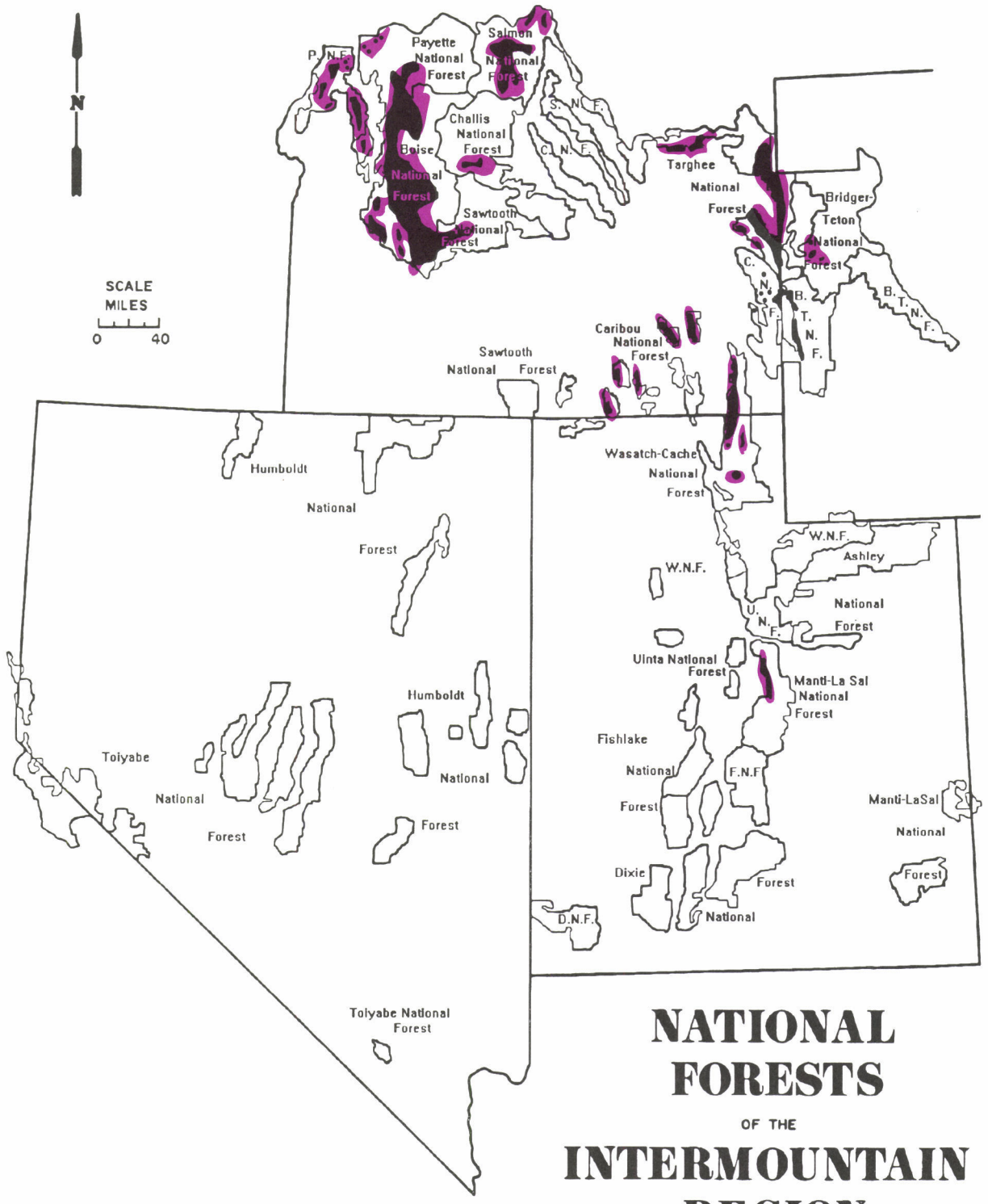


Figure 6. Areas infested by western pine beetle and *Ips* beetles in Region 4 during 1993 as observed during aerial detection surveys.

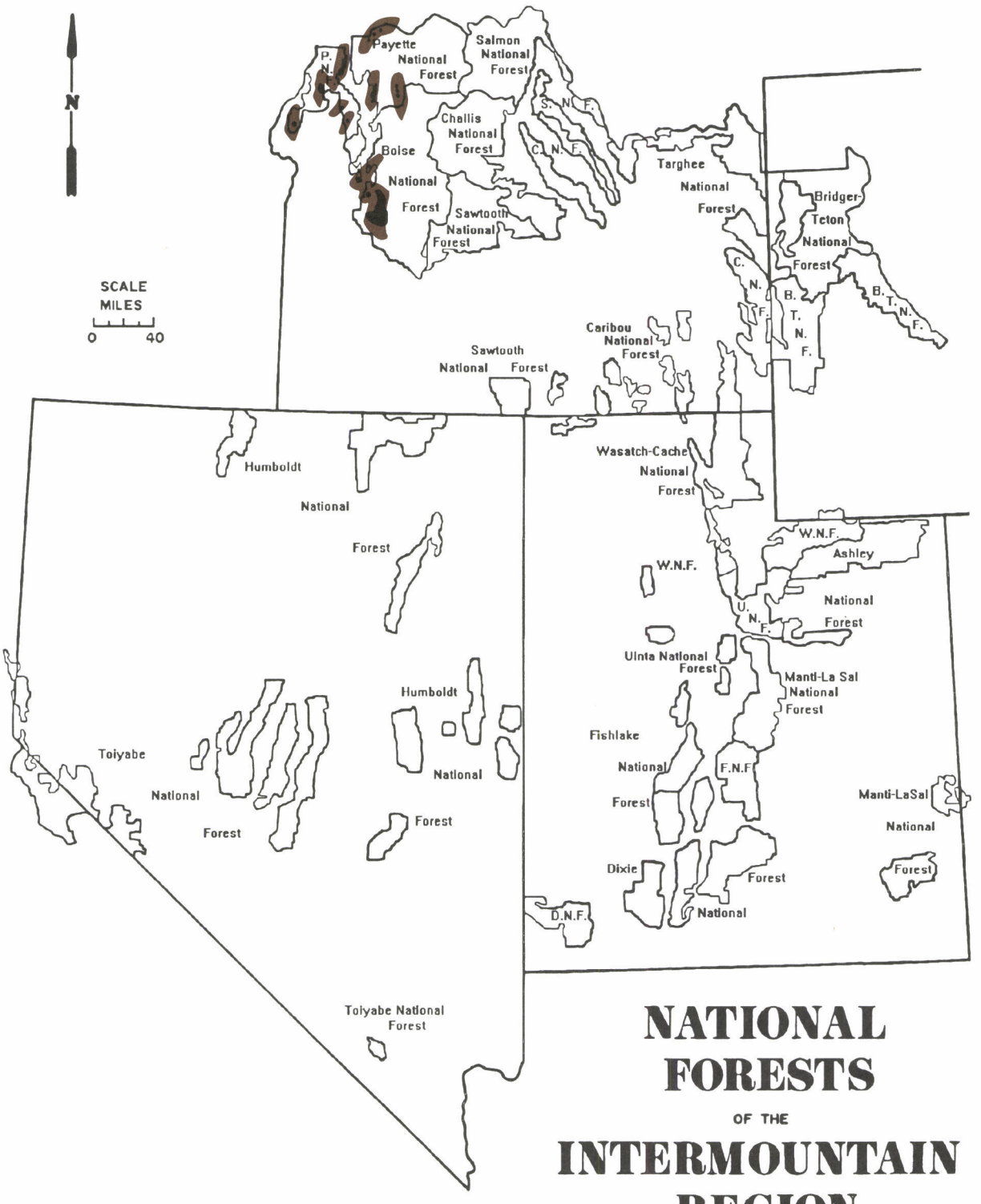
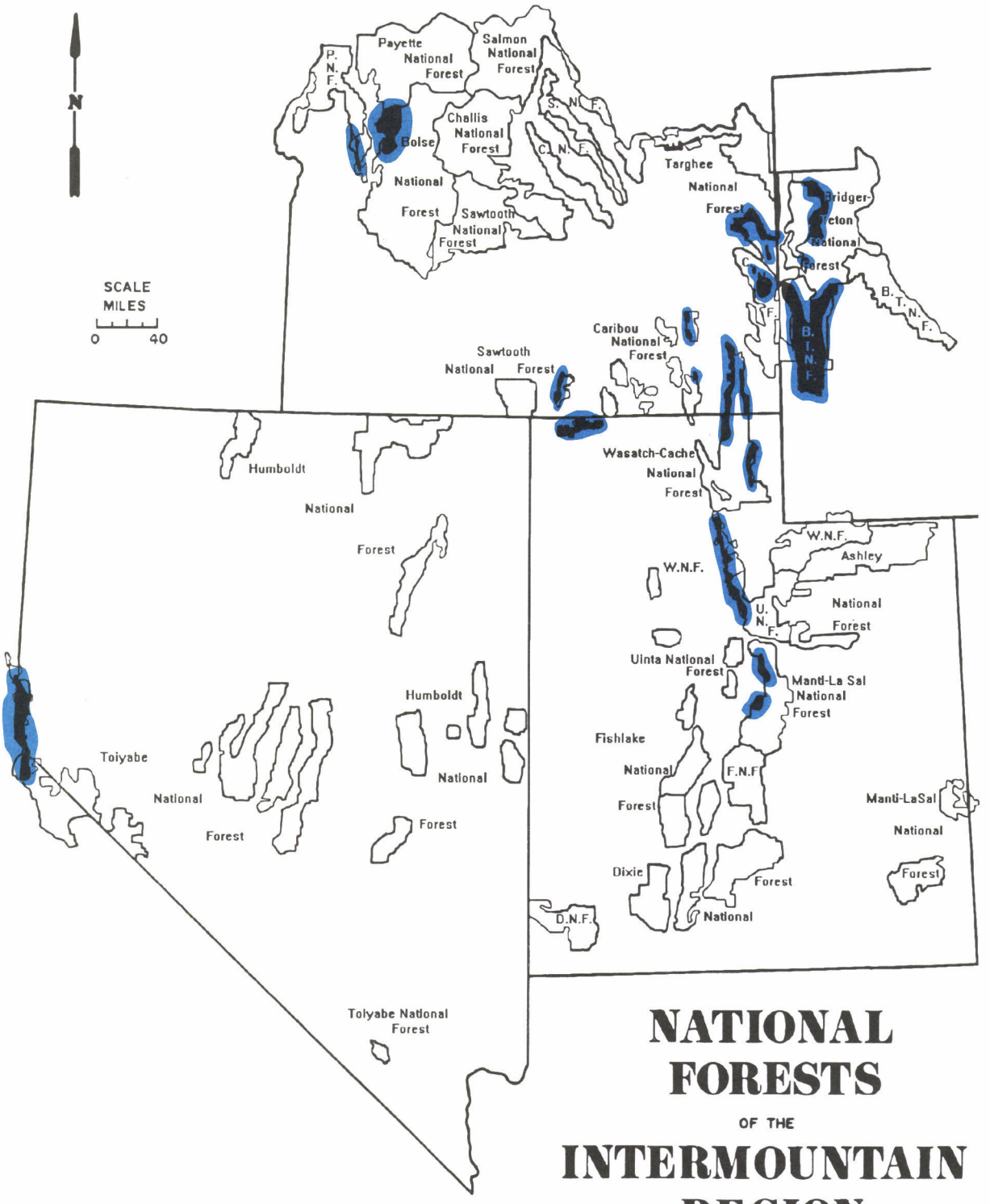


Figure 7. Areas infested by fir engraver beetle and western balsam bark beetles in Region 4 during 1993 as observed during aerial detection surveys.



Permanent Plots to Validate the Dwarf Mistletoe Extension of Forest Vegetation Simulator (FVS). The purpose of this ongoing, westwide project is to establish a database to validate and calibrate the dwarf mistletoe model linked to the FVS. Five new permanent plots were established on three National Forests. Twenty-six plots were remonitored on four National Forests. A database was created by FPM-MAG to house data from all types of permanent plots. This database may be useful for other types of data other than pest permanent plots, timber and range plot data. Contact: J.Guyon.

Westwide Pine Bark Beetle Impact Model. This has been the second year of a model development project to predict the impacts of mountain pine beetle on ponderosa and lodgepole pine, western pine beetle, and *Ips* in western forests. The existing bark beetle models which are linked to the Forest Vegetation Simulator include mountain pine beetle for lodgepole pine and Douglas-fir beetle; creating a need for a new model. Region 4 and FPM-MAG are the main cooperators of this project, along with a core group of personnel from different Regions involved with bark beetle management and research. The model development work has been contracted to a private company, Environmental and Social Systems Analysts Ltd (ESSA). ESSA has used a participation workshop format to collect information necessary to develop the prototype model. The prototype model has been reviewed by Forest Service cooperators and modifications have been incorporated based on suggestions. The final model will be presented to cooperators in March 1994. Details for training and implementation of this model should be available after that time. Contact: D.Hansen.

Development of Aerial Video For Operational Use in FPM Programs. This multi-year technology development project will identify capabilities of and guidelines for the operational use of aerial video in detecting and monitoring a variety of pest activities. In 1992, five test sites located in Utah, Idaho, and Montana were identified by Region 4 and imagery was obtained by the Methods Application Group. Image analysis and ground truth surveys were initiated in 1993 and will be completed in 1994. Contact: K.A. Knapp.

Thinning Demonstration of Dwarf Mistletoe-Infected Lodgepole Pine on the Targhee National Forest, Idaho. Data was taken again from sixteen permanent plots on the Targhee National Forest. The 100-tree plots represent four replicates of four spacing level regimes thinned in 1983. Objectives of the long-term study were to determine: 1) the effects of pre-commercial thinning on growth of dwarf mistletoe infected lodgepole pine; 2) the changes of dwarf mistletoe incidence and intensity over time; and 3) the effects of dwarf mistletoe parasitism on growth and mortality of lodgepole pine. Plots are re-measured every 5 years. Contact: J.Hoffman.

Alternatives to Methyl Bromide Fumigation - Inclusion of the Lucky Peak Forest Nursery in the West-Wide Research Effort. The USDA Forest Service nursery just outside of Boise, Idaho was included in a west-wide, 5-year evaluation of alternative technologies for the management of soil-borne diseases and weeds in bareroot forest nurseries. The project will evaluate efficacy of different cultural regimes, including alternative cover crops, soil amendments, and crop rotation schemes to reduce the impacts of pests on conifer seedlings. Contact: J.Hoffman.

Drift/dispersion and effect of Bacillus thuringiensis (Bt) in mountain terrain on non-target Lepedoptera. Objectives are: 1) to evaluate the effects of Bt on selected non-target lepidoptera species in the Wasatch Mountain Range of northern Utah; 2) to quantify the deposition of Bt on host foliage on non-target lepidoptera and to compare results with FSCBG model predictions of deposition on host foliage; 3) to evaluate size of buffer zones needed to protect non-target lepidoptera colonies from Bt spray drift; 4) to compare FSCBG model drift predictions to dosage recoveries from Rotorod spinning samplers; and deposition recoveries from Mylar deposit samplers and Gambel oak foliage; 5) to evaluate the ValMet module of FSCBG dispersion predictions by comparing predictions of Bt deposition and airborne dosage; 6) to evaluate relationship of Bt recoveries among sampler types and Gambel oak foliage; and 7) to investigate residual Bt recoveries that might persist at mouth of Mill Creek Canyon after treatment. Contact: J.Barry at Davis, CA, (FPM-Washington Office).

Release and Capture of Sterile Gypsy Moth in Mountainous Terrain. Objectives are: 1) to determine percent recapture and flying distances of released sterile male moths using various trapping grids within different terrains; and 2) to determine the optimum trapping grid system for mountainous terrain. Contact: J.Anhold.

Effects of Temperature and Relative Humidity on Gypsy Moth Pupae. The objectives are to determine the effects of temperature and relative humidity on Gypsy Moth pupae survivability as related to location within the stand canopy and aspect. Contact: M.Quilter at Utah Department of Agriculture.

Recent Publications

Anhold, J. 1993. A biological evaluation of spruce beetle activity in the Neffs Management Area, Fishlake, Loa Ranger District. FPM Report 93-01. Ogden, UT, USDA Forest Service, Intermountain Region, 10 p.

Beckwith, R.C., Grimble, D., and Weatherby, J.C. 1993. Instar development of the Douglas-fir tussock moth in relation to field temperatures. USDA Forest Service Research Note PNW-RN-512. Pacific Northwest Research Station, Portland, OR, 4 p.

Gardner, B. 1983. Bibliography Intermountain Region Forest Pest Management Publications: 1921-1993. FPM Report 93-08. Ogden, UT, USDA Forest Service, Intermountain Region, 48 p.

Helzner, R. and Thier, R. 1993. Pine butterfly in southern Idaho: 1893-1984. FPM Report 93-06. Ogden, UT, USDA Forest Service, Intermountain Region, 25 p.

Orland, B., Paschke, J., Daniel, T., and Hetherington, J. 1993. Visualization of Forest Management issues on the Dixie National Forest. Ogden, UT, USDA Forest Service, Intermountain Region, 57 p.

Thier, R. and Munson, S. 1993. Efficacy of MCH to prevent spruce beetle infestation. FPM Report 93-02. Ogden, UT, USDA Forest Service, Intermountain Region, 8 p.

Thier, R. 1993. A field test of the efficacy of MCH in preventing Douglas-fir infestation by Douglas-fir beetle. FPM Report 93-03. Ogden, UT, USDA Forest Service, Intermountain Region, 7 p.

Weatherby, J. and Thier, R. 1993. Preliminary validation of a Douglas-fir beetle hazard rating for use in southern Idaho. FPM Report 93-04. Ogden, UT, USDA Forest Service, Intermountain Region, 14 p.

Weatherby, J. and Thier, R. 1993. Preliminary validation of a Douglas-fir beetle hazard rating system, Mountain Home Ranger District, Boise National Forest. FPM Report 93-05. Ogden, UT, USDA Forest Service, Intermountain Region, 7 p.

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